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AGRONOMY 2

Laboratory Exercises

DIVISION OF

Farm Mechanics

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LABORATORY EXERCISES IN AGRONOMY 2

All laboratory reports must be written in ink on 8½x11 inch paper. Drawings must be made on T. & A. M. paper, ruled five squares to the inch, and may be in pencil if desired. All reports should be neatly paragraphed, with various headings conspicuously placed. The report should be as short and concise as is consistent with clearness. Reports are to be bound in plain Manila covers with student's name plainly written on the outside in the upper right-hand corner. Each report must have a title page arranged as follows:

Agronomy 2A

Exercise No. 1
TITLE
Student's Name

Date due
Date rec'd
Grade
Deduct for lateness
Final Grade

Unless otherwise specified, the report of a laboratory exercise is due the next recitation after it has been completed in the laboratory. Two points will be deducted from the grade on the report for each day it is late. Laboratory grades will be based on attitude toward work, character of work done, and on written reports. In the reports, the basis for grading will be as follows:

Conclusions	50 points
Accuracy of data	40 points
Form and neatness	10 points

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METHOD OF TAKING DATA

In most laboratory exercises the class will be divided into squads of four men each. As required in the equipment, each squad should supply themselves with carbon and onion-skin paper. One man in each squad will act as recorder, making a carbon copy of the data for each man in the squad. Check out a small tablet from the tool room.

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METHOD IN PREPARING DATA

The laboratory work divides itself naturally into two classes, viz.: the comparative study of machines, and the operation of machines. When a comparative study is made, either one of two general ideas as to reports may be followed. The data may be copied neatly into the report, and conclusions drawn therefrom; or a direct comparative discussion of the different makes or types of machines may be given in which the essential details are emphasized, using sketches when necessary.

In reporting tests, the condition of the test should be given, and data recorded as indicated in the guide. From this, complete and definite conclusions should be drawn.

Regular problems must be on 8½x11 inch paper, folded from the right to the left through the middle, with open side to the left, and should be endorsed at the top as follows:

AGRONOMY 2

Name
Date
Problem No.

EQUIPMENT

Regulation shop suit

1 5 or 10 foot tape.

1 loose-leaf note book, side opening, 8½x11 inch paper.

1 dozen plain Manilla covers, 8½x11.

1 box ½ inch brass fasteners.

1 dozen sheets cross-ruled paper 8½x11, 5 squares to the inch.

½ dozen sheets carbon paper.

2 dozen sheets onion-skin paper.

½ dozen sheets cross-ruled paper, 4 squares to the inch.

Exercise 1.

EQUALIZERS

(One period)

Instructions for this exercise will be given in the laboratory.

Exercise 2.

CONSTRUCTION OF PLOWS

(Two periods. Report on two gangs and one sulky plow.)

GENERAL

1. Name and address of manufacturer.
2. Type and size of plow.
3. High or low lift.

PLOW BOTTOM

4. Size.
5. Type of moldboard.
6. Where are reinforcements, if any?
7. Height and length of landside.
8. How is suction secured? (Diagram)
9. Measure dip at the point.
10. Measure length of point.
11. Measure bearing at wing.
12. Measure width of share.

BEAMS

13. Are beams in line with plow bottom?
14. Single or double bail.

WHEELS.

15. Number and diameter of each.
16. Are the wheels perpendicular to the surface of the ground and parallel to the line of draft? Why?
17. Type of boxes.
18. Method of lubrication.

HITCH

19. Make a diagram of equalizers showing how far the hitch comes from the true line of draft.
20. Take measurements from which to figure the height at which the equalizers should be attached to plow to have the line of hitch from the center of draft to the point of attachment on the hames, straight.

OPERATION

21. Can plow be locked or floated?
22. Figure out the mechanical advantage of the footlift.
23. How is the width of the furrow regulated?
24. What range of depth can be secured?
25. How is depth regulated?
27. Describe arrangement for changing the angle of the two furrow wheels to overcome side draft?

Exercise 3.

ENGINE GANG PLOWS

Instructions and exercise sheets for this exercise will be given in lecture.

Exercise 4.

HARROWS

(One period.. Report on one spike tooth and one disc harrow)

SPIKE TOOTH HARROWS

1. Width and estimated weight.
2. Number of sections? Number of horses? Width of section?
3. Number of bars per section?
4. Number of teeth per section?
5. Is this a typical spike tooth section?
6. Number of teeth per foot of width?
7. Type of bar?
8. Type of tooth?
9. How is tooth held? Can it be easily removed?
10. What is the present extension and can this be varied?
11. How is frame braced (diagram.)
12. Has it guarded ends?
13. Method of transportation?
15. Draw sketch of draft bar showing way in which sections are fastened to it and to one another.
16. Is draft bar attachment likely to allow sagging? If so, is an arrangement provided to take up the sag?

DISC HARROWS

1. Kind.
2. Width.
3. Width of sections and number?
4. Number of discs per section? Diameter? Distance between discs. Designate size in manufacturer's terms.
5. How are discs held on shaft? What is the function of the bumpers and sleeves?
6. What kind of throw?
7. How is end thrust taken care of?
8. Are sections angled independently? Advantage, if so.
9. Purpose of angling?
10. Width of leak at greatest angle? Is there any attachment to disturb this leak?
11. How are scrapers operated? How can they be adjusted?
12. Number of bearings per section. How constructed? How distributed and method of oiling?
13. Can machine be loaded?
14. Sketch frame showing bracing.
15. Can tongue truck be removed and a solid tongue put in place?
16. Describe movement in tongue truck.
17. How can height of hitch be changed? Purpose?
18. Is there any arrangement to keep inner and outer discs at same depth when sections are angled? Describe, and state force that accomplishes leveling and how it is shifted?
19. Are tongue truck axles dust proof?
20. Method of transportation?
21. Where is the doubletree attached?
22. Describe briefly how disc is sharpened? Can this method be used on a cut-out disc?

Exercise 5.

FANNING MILLS. CONSTRUCTION.

(One period. Report on two mills.)

1. Name of mill and manufacturer.

FEED

2. Capacity of hopper.
3. Length and greatest width of opening.
4. How is size of opening varied?
5. Agitation or force feed arrangement?

SHOE

6. Side or end shake and length of stroke. Can stroke be varied? If so, what are the limits of adjustment?
7. Number of screens and sieves which shoe will contain, and methods of making adjustments.

SCREENS

8. Width and length inside.
9. Give brief statement, with illustrations, covering number of screens, material, size and shape of openings.
10. How are screens numbered?

SIEVES

11. Width and length.
12. Give brief statement, with illustrations, covering number of sieves, material, size and shape of openings.
13. How are sieves numbered?
14. Is there any arrangement for keeping sieves clean? If so, describe.

AIR BLAST

15. Diameter of fan.
16. Width of fan.
17. R. P. M. for ordinary work.
18. Explain, by description or diagram, just how the blast is applied to the grain, showing how it is expanded or restricted, and just where it meets the grain.
19. Make a cross-section drawing showing arrangement of sieves, and where each grade of grain comes out.

    (18 and 19 may be combined.)
20. Does the machine depend upon size and shape of kernel, or upon weight of kernel for separation?
21. Describe briefly the arrangements for taking care of the various grades of grain obtained.

Exercise 6.

FANNING MILLS. OPERATION.

(Two periods)

Study the operation of the assigned mill by the following tests:

(a) Cleaning and grading three bushels of oats.
(b) Cleaning and grading three bushels of wheat.
(c) Cleaning and grading one bushel of clover seed.
(d) Cleaning and grading one bushel of timothy seed.
(e) Separating one bushel of wheat from one bushel of oats.

The object of this exercise is to study the principles of operation for various kinds of work, and to decide what sieves and screens are best adapted to the work in hand.

Tests A, B, C, and D.

The object of these tests is to secure the best possible grade of grain for seed. In order to do this, the squad should select the screen best suited to the grain. Select a sieve which in your judgment is the smallest mesh that would ever be used for cleaning the grain in hand. This will carry over all good grain which will be run over a large sieve. At least three sieves should be tried. It can be determined from the results which is the most desirable sieve to use. Before each test is started, a short preliminary test should be run to determine the proper R. P. M., the proper angle of sieves, the proper arrangment of the air blast, proper width of openings, etc. Repeat each test twice. When running the tests, the machine should be set as found most satisfactory in the trials. The person turning the machine should count the R. P. M. every third minute, keeping this as near the standard as possible. Record data as follows:

SAMPLE DATA SHEET

Name of Machine______________________________

Test	Run	Screen No.	Sieve No.	Original Grain		First Grade		Second Grade		Third Grade		Tailings		Total Minutes	Bushels Per Hour	R. P. M.	Opening of Feed	Condition of Blast
				Total Wt.	Wt. Per Bu.	Total Wt.	Wt. Per Bu.	Total Wt.	Wt. Per Bu.	Total Wt.	Wt. Per Bu	Total Weight						
(a) Oats	1																	
	2																	
	3																	
	Averages																	
(b) Wheat	1																	
	2																	
	3																	
	Averages																	

In the table (of which the above is a sample of the required form), as many grades of grain should be recorded as the machine makes. The weight of the tailing is not important and may be obtained by subtracting the sum of the weights of the other grades from the original total.

Examine the first grade from each test and determine which would be best for seed.

When a test is completed, mix together all grades thoroly and resack.

TEST E.

Arrange the machine to separate the wheat from the oats. Make a general report as to the success of the operation.

Exercise 7.

CORN SORTERS. CONSTRUCTION AND OPERATION.

(One period. Report on two machines. Run test on one)

1. Name of machine. Name and address of manufacturer.
2. What motion or motions has the sorter?
3. How is sorting accomplished?
4. Give size of riddles, and size and shape of mesh.
5. Make a cross-section diagram of the sorter showing number and position of riddles, and place where various grades of corn are delivered.
6. Obtain forty ears of corn and sort the grain from twenty ears by hand, and from twenty by machine. Take special pains to have proper arrangement of sieves and proper speed to obtain the best results for the corn used. Keep a record of the time taken to machine sort in order to get the capacity of the machine. Record data as indicated on opposite page and compare carefully.

SAMPLE DATA SHEET

	Hand Sorted	Machine Sorted
Weight of tips		
Weight of butts		
Weight of large kernels		
Weight of small or narrow kernels		
Totals		
Weight of select kernels		
Grand Totals		
Percentage of select kernels		
Time required		
Bushels per hour		

Exercise 8.

CULTIVATORS.

(One period. Report on two single and one double row machines)

1. Name of manufacturer.
2. Riding, walking or both.
3. Surface, disc or shovel.
4. Has it a balanced frame?
5. Width and shape of tires.
6. Heighth of wheel.
7. Has wheel an inclosed dust-proof boxing?
8. Method of oiling.
9. Has it pivotal wheels? If so, how regulated?
10. Number of shovels. Size.
11. Curved or straight shovels.
12. How fastened and adjusted?
13. What kind of shields and how adjusted?
14. Distance between shovels from center to center.
15. How can distance between gangs be varied? Give range.
16. How is double hinge motion secured?
17. Is there any provisions for taking up wear?

18. What aids in lifting gangs? Describe them.
19. Can gangs be forced into the ground? How?
20. Does lifting device cause gang to swing in a circle when in the ground?
21. How is distance apart of gangs adjusted?
22. What arrangement has this machine for dodging hills of corn?
23. Hitch—how attached, height, adjustment, width of singletree?

Exercise 9.

GRAIN DRILLS.

(One period. Report on one large and one small drill)

1. Name of machine and name and address of manufacturer.
2. Size.
3. Number of horses. Feet of width per horse.
4. Hitch, number of poles, attachment, etc.
5. Frame—material, shape, how braced or trussed.
6. Has it a horse-lift? If so, describe it.
7. Furrow openers—number, kind, size.
8. Can furrow openers be thrown out of line?
9. Can their distance apart be regulated?
10. Does seed drop in front of journal?
11. How are discs held in the ground?
12. Bearings—kind, method of oiling. Draw cross-section diagram of bearings.
13. Grain tubes—size and kind.
14. How is power transferred from mainshaft to feed?
15. Describe force-feed arrangement. Does it differ for different grains?
16. How many revolutions does force-feed shaft make to one of drive wheel? How can this be varied?
17. How is amount of grain sown regulated?
18. Describe grass-seed attachment, if any.
19. Is the seed box provided with truss rods?
20. Describe covering device.
21. How is machine thrown out of gear when shoes are raised?

Exercise 10.

CORN PLANTERS. CONSTRUCTION.

(One period. Report on two machines)

1. Name of machine. Name and address of manufacturer.
2. Kind of furrow openers.
3. Kind of wheels and advantages of this type. Size, width, and width of opening.
4. Describe adjustment for leveling shoes.
5. How is depth of planting regulated?
6. How far is the shoe from the wheel? Importance of this distance.
7. How is the width apart of rows regulated? What are the limits?

8. How is a planter thrown in and out of gear?
9. Describe marker.
10. Is the fork rotary, vertical, or horizontal?
11. Describe clutch in detail.
12. Are seed plates and valves operated by the fork, or from the wheel?
13. Is plate arranged for hill, edge, or flat drop?
14. Do plates revolve continuously?
15. How is adjustment made for corn of various sizes?
16. How is number of kernels per hill regulated?
17. How is planter changed for drilling?
18. Describe arrangement for assisting corn to seed plates.
19. Describe cut-off and knock-out.
20. Draw cross-section of planter shank showing valves.
21. Does the bottom valve have a kick-out which counteracts speed of planter?
22. Has the planter a sight feed?
23. Wire: description, method of taking up. Can it be taken up as as the last row is planted? Is it securely held by and easily removed from the guides?
24. Study the plates as to arrangement to aid in the filling of the pits, and as to the difference in size of pits between two plates which are next in size to one another. Give diameter of plates, and thickness at the outer edge.
25. Study plate holders and note arrangement, if any, for different shaped kernels. How many sets of plate holders are there, and what is the function of difference between them?
26. How are seed boxes emptied? Must seed be removed from the hoppers when the plates are changed?

Exercise 11.

CORN PLANTERS. OPERATION.

(One period. Use grade of corn assigned and report on one hill drop, one flat drop, and on one edge drop machine)

The object of this exercise is to study the effect of proper plate selection on accuracy of drop. When tests have been run on all grades of corn, the instructor will combine the data obtained and from his tabulations a study may be made of the effect of grade upon accuracy.

Obtain corn from instructor and secure assignment to machines. Set machine to drop a 3-kernel hill and thruout the tests see that the planter parts move at the speed they would if the machine were passing over the ground at a rate of two and one-half miles per hour.

On the machine assigned select that plate which in your mind seems best suited for your seed. With this plate, with the plate whose pits are next larger and with the plate whose pits are next smaller run short preliminary tests to determine the plate giving the most accurate drop. Label this plate "Right". Label that plate

"Small" whose pits are the next size smaller than those in the "Right" plate, and label the next larger plate "Large". With each plate run a test of 200 hills recording the number of 0, 1, 2, 3, 4 and 5-kernel hills. Disregard the cracked or broken kernels.

Repeat the above operation on each of the other two kinds of drop planters. One student should pick the cracked kernel from the corn which has been used, and can also figure the preliminary data preparatory for entering upon the final data sheet.

Preliminary data should be taken on cross-ruled paper, 4 squares to the inch, each square representing one hill. A block of squares can be ruled off containing 200 squares. This data should then be summed up and entered on the final data sheet, a sample of which follows:

SAMPLE DATA SHEET

Grade of Corn used..

Kind of Drop Name of Planter	Plate		Number of Hills Containing						% Accuracy
	Designation	No.	0s	1s	2s	3s	4s	5s	
Hill Drop	"Small"								
Planter________	"Right"								
	"Large"								
Flat Drop									
Planter________									
Edge Drop									
Planter________									

Exercise 12.

RAKES AND LOADERS

(One period)

DUMP RAKES

(Report on one machine)

1. Name and manufacturer.
2. Diameter of wheels.
3. Width of swath.
4. Teeth-number, distance apart, diameter, spring, method of attaching.
5. Rake frame—kind, supports.
6. How is hay kept from being carried up by wheels?
7. Describe method of dumping.
8. Number of horses. Can this be varied? How?
9. Advantages and disadvantages of this type of rake.

SIDE DELIVERY RAKES

(Report on one machine)

1. Name and manufacturer.
2. Wheels—number, diameter, arrangement.
3. Number of pawls in drive wheel and number engaged at one time.
4. Width of swath.
5. Angle at which rake is set.
6. Teeth—kind, length, distance apart, spring, how attached.
7. Method of supporting rake.
8. Can rake be raised or lowered?
9. Ratio of R. P. M. of drive wheel to R. P. M. of rake cylinder.
10. State advantages and disadvantages of this rake.

HAY LOADERS

(Report on two machines)

1. Name. Name and address of manufacturer.
2. Width of swath.
3. Is the machine for swath, windrow, or both?
4. Method of elevating hay. Describe elevator.
5. If of cylinder type, describe cylinder and method of driving it. If of rake type, describe method of operating rakes.
6. Speed of elevator when team goes two miles per hour.
7. Limits of adjustment of height to which hay is elevated.
8. How is tension of elevator adjusted?
9. How is loader attached to wagon?

Exercise 13.

MOWERS

(Two periods. Report on two machines)

1. Name. Name and address of manufacturer.
2. Width of swath cut.

3. Diameter and width of wheels. Give position of lugs and distance apart of wheels.
4. Bearings—location, kind, size of shaft bearings.
5. How is drive shaft driven from drive wheels? How many pawls per wheel? How many pawls engaged at one time.
6. Pitman—length, material, adjustment at crank wheel and sickle head.
7. R. P. M. of crank wheel when mower goes two miles per hour.
8. Strokes of sickle per foot of advance of mower.
9. What is the greatest distance the machine would have to move to start the sickle?
10. Find the guards, ledger plates, clips, wearing plates, swath board. Purpose of each.
11. What arrangement for varying length of stubble?
12. Limit of tilting of sickle bar.
13. Describe foot-lift. How high does it raise the bar?
14. Can the bar be raised vertically by levers?
15. Cutter bar straight or curved when in vertical position?
16. Has this mower a draft bar? Purpose of it?
17. What is the purpose of push bar, if one is present?
18. Describe any arrangements for relieving side-draft.
19. When cutting, is cutter-bar weight on drive wheels.
20. Locate wrist pins and state number.
21. Can the sickle bar be lined with the pitman? If so, describe the arrangement which allows it. How far is it possible to move the outer end of the sickle bar, the wrist pins acting as a center?
22. How can the sickle sections be made to center in the guards?
23. Explain how machine is thrown in and out of gear.
24. If the machine "chewed" off grass instead of cutting it cleanly, name four parts of sickle and knife bar to which you would look for trouble.
25. Are the ledger plates carefully lined when the machine is new? Why?

Exercise 14.

BINDERS. COMPARISON.

(One period. Report on five machines.)

In writing up this exercise, give the number of the question and the names of the binders which answer the requirements. What binders have the following:

1. Cog twine tension.
2. Compressor and trip in one piece.
3. Knife attached to twine disc.
4. Stationary knife.
5. Knife arm.
6. Tyer shaft chain driven.
7. Twine disc driven by a worm gear.
8. Twine disc driven by a plunger.

9. Double goose neck.
10. Platform brace from the goose neck.
11. Platform canvas tightener.
12. Outside reel support.
13. Inside divider movable.
14. Outside divider movable.
15. Packers stationary while bundles are being tied.
16. Three packers.
17. Removable wearing part in eye of needle.
18. Dog rollers attached to packer shaft.
19. Dog on binder head counter-shaft.
20. Dog rollers on dog.
21. Coiled dog spring.
22. Canvas slackeners in upper elevator.
23. Canvas slackeners in lower elevator.
24. Number of sprockets in elevator chain which transfer power.
25. Number of tighteners or idlers in elevator chain.
26. Packer shaft driven from countershaft.
27. Packer shaft driven from elevator chain thru extension coupler.
28. Binder head support bar.
29. Shifting lever in front of operator.
30. Adjustment in tongue trucks to overcome side-draft.
31. Iron pitman.
32. Gear driven reel.
33. Bundle carrier the teeth of which fall directly down.
34. Upper elevator driven from the lower roller.

Tell how the dog is timed and how the disc is timed on each machine

Give the adjustment of the reel on each machine. Give actual measurements with reference to the sickle.

Give the longest and shortest lengths from the butt to the band of the bundle on one machine, giving the name of the machine.

Give the longest and shortest length of stubble obtainable with one machine, making allowance for the bull wheel lugs. Have platform level from left to right, and name the machine.

Exercise 15.

BINDERS. CONSTRUCTION AND OPERATION.

(One period. Report on one machine as assigned).

1. Name of machine.
2. Trace power from bull wheel to binder head and figure the distance the binder goes in tying a bundle.
3. Trace power from bull wheel to the three canvases and figure the distance each goes while the binder moves 100 feet.
4. Trace power from the bull wheel to the reel and figure the distance the circumference of the reel goes while the binder moves 100 feet.

5. Trace power from the bull wheel to the sickle. Give length of stroke of sickle and distance sickle moves while binder moves 100 feet. Number of strokes for 1 revolution of bull wheel.
6. Method of bracing and squaring the "A" frame. (Diagram).
7. Method of attaching binder head.
8. Which side of the canvas runs tight?
9. Diagram of whiffletrees showing three and four horse hitch.
10. What are limits of adjustment for reel: (a) up and down relative to sickle bar; (b) forward and backward relative to points of sickle?
11. What arrangement for raising and lowering outer end of reel relative to inner end.
12. Give limits of adjustment in raising and lowering the deck cover.
13. Explain in detail how the size and tightness of the bundle is regulated.
14. Where is the twine tension and how adjusted?
15. What arrangement for overcoming side draft?
16. How high is the grain elevated?
17. What adjustment is there for taking up wear between cogs on main drive shaft and counter-shaft?
18. What arrangement is there for centering the sickle in the guards?
19. Explain how binder is placed on road trucks.
20. What adjustment of binder head, butter, and grain boards would you make for (a) short grain; (b) very long grain; (c) long grain, which contains many short straws?
21. Familiarize yourself with the following terms: quadrant, main shaft, counter-shaft, gudgeon, universal joint, tilting lever, reel shifting lever, reel raising lever, butter lever, shifting lever, gear lever.

Exercise 16

BINDER-HEADS. CONSTRUCTION AND ADJUSTMENT.

(Two periods. Report on one binder-head as assigned).

1. Familiarize yourself with the following parts and their functions:
    (a) Binder-head frame, dog, dog rollers, dog catch, dog spring, binder-head counter-shaft, tyer shaft, needle pitman, tyer shaft cam gear, tyer shaft lock, compressor arm, compressor rod, compressor bell crank, compressor spring, compressor link, trip arm, trip rod, trip spring, stop arm, breast plate, breast plate supports, grain checks, knotter head cam wheel, discharge arms, bundle stripper.
    (b) Knotter head, knotter head frame, knife, knife arm, knotter bills, knotter bills track, knotter bills shaft, knotter bills pinion, disc, disc shaft, disc plunger, and arm or disc worm or disc pinion, disc cylinder or disc plates, disc spring, twine holder, knotter bills spring, twine stripper.
2. Without making adjustments write up how the binder is timed.

3. Lengthen the needle pitman gradually, noting the effect on the knot. Draw sketch of band you finally obtain. Just why and how does this condition exist? What happens then when the needle eye becomes badly worn? Shorten the needle pitman, and see what trouble you find. Leave needle properly adjusted.
4. Gradually loosen the tension on the knotter bills and note effect on the knot. Draw sketch of knot obtained when bills are too loose. Just why and how does this condition exist? What is the function of the "hump" on the upper bill? Now tighten the tension gradually and note what happens. If the spring is too tight, what is most likely to happen when the bundle is cast, and why? Leave tension properly adjusted.
5. Gradually loosen the twine holder spring and note effect upon tying. (In tying these knots, keep about a thirty pound pull on the disc strand of the loop in which the bundle would lay.) Draw sketch of band obtained. Just how and why does this condition exist? Gradually tighten the twine holder spring and note effect on tying. When the spring is very tight, perform the following:
    (a) With the needle advanced as far as possible, and while both ends of the band are still in the disc exert about a fifty pound pull on the loop. If the loop pulls out, note the condition of the ends of the twine.
    (b) With the needle in its position of rest, exert a twenty pound pull on the twine in the disc. What is liable to happen when the strain increases as the needle advances and the operation of knot tying begins.

Will a badly grooved twine holder or disc plates give the same trouble that a loose disc spring will? Leave disc spring properly adjusted.

6. If possible, throw disc parts out of time and note effect. Why must the disc be timed?
7. Note carefully the operation of the twine stripper?
8. Write up the binder head briefly covering the following points: dog, location, shape and function; dog spring, shape, method of attaching and function; method of adjusting compressor and trip arms for tying large and small bundles, and tight and loose bundles; locking of discharge arms; complete write-up of knotter head; any points of especial interest peculiar to the particular head.
9. Take down binder head and consult instructor before assembling. State only what you were careful to do in order to have it properly adjusted. Leave head properly adjusted for field. Heads will be carefully graded.

Exercise 17.

SPREADERS

(Two periods. Report on two machines.)

1. Name. Name and address of manufacturer.
2. Type of apron.
3. Frame—material, kind, size, bracing and trusses, method of making joints and attaching casting.
4. Is box wider at rear than in front?
5. Height of top of sides above ground.
6. Wheels—kind, diameter, width, width of track.
7. Bearings.
8. How are gears and chains protected?
9. Capacity of box in bushels and cu. ft.
10. Does apron slope to the rear?
11. Hitch—make diagrams showing methods of hitch.
12. Do wheels track?
13. Operation:
    - (a) Method of throwing in gear.
    - (b) Method of driving cylinder and apron.
    - (c) Can cylinder be run when apron is stopped?
    - (d) How is apron returned?
    - (e) How is speed of apron regulated?
    - (f) Description of rake and method of operation.
    - (g) R. P. M. of cylinder to one revolution of bull wheels.
    - (h) Number of teeth in cylinder per foot of width.
    - (i) Determine least number and greatest number of loads per acre that can be supplied.

Exercise 18.

POTATO MACHINERY

(One period).

DIGGERS

1. Name of machine and manufacturer.
2. Describe frame.
3. Height and width of drive wheels, distance apart, length of lugs.
4. Kind of bearings on main shaft.
5. How is the depth of the shovel adjusted? Limits of adjustment.
6. How are the potatoes elevated and cleaned? Height and width of elevator?
7. Is there any mechanism to separate the vines from the potatoes when delivered?
8. How many horses are used on this machine?

PLANTERS

(Report on two machines)

1. Name of machine and manufacturer.

2. Is this a one or two man machine?
3. What kind of furrow opener has it?
4. Is there a fertilizer attachment? If so, what kind?
5. How is the dropping accomplished?
6. How far apart are the seeds dropped?
7. How many horses used on this machine?
8. Covering device.

SPRAYERS

(Report on one machine)

1. Name of machine and manufacturer.
2. How many rows does it spray?
3. Are working parts easily accessible?
4. How are nozzles adjusted for spraying?
5. Is the discharge in the front or in the rear of the tank?
6. Describe the pump.
7. Is the tank made of iron or wood? Which do you think is preferable, and why?
8. What is the capacity of the tank?
9. Is there any arrangement for regulating the pressure in the tank?

Exercise 19.

GRAIN ELEVATORS

Instructions and exercise sheets for this exercise will be given in lecture.

Exercise 20.

THRESHING MACHINES

Instructions and exercise sheets for this exercise will be given in lecture.

Exercise 21.

WAGONS

Instructions and exercise sheets for this exercise will be given in lecture.